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U S WEST

May 19, 1999

EX PARTE OR LATE FILED

Ms. Magalie Roman Salas, Secretary
Federal Communications Commission
The Portals, 445 Twelfth Street S.W.
Washington, D.C. 20554

RE: CC Docket 96-45 and 97-160
Cost Proxy Model Proceeding

Dear Ms. Salas:

Pursuant to the request of the Commission Staff of the Accounting Policy Division of the Federal Communications Commission (Commission), U S WEST is submitting comments and a template for plant mix , resulting from its analysis of the Synthesis Model , to the Commission for study and use in the above captioned dockets.

In accordance with Section 1.1206(a)(2) of the Commission's Rules and Regulations, the original and four copies of this letter, U S WEST's comments , and diskettes containing the plant mix template, are being filed with your office for inclusion in the public record for the above-captioned proceedings. A courtesy copy of this data will also be sent directly to Craig Brown, Accounting Policy Division, via messenger. Acknowledgment of the date of receipt of this transmittal is requested. A duplicate of this letter is provided for this purpose.

Please contact me if you have any questions.

Sincerely,

Kenneth T. Cartmell

cc: Craig Brown (with diskette)
Peter Copeland, US WEST
Chuck Keller
Katie King
Jeff Prisbrey

U S WEST has, throughout the development of the Synthesis Model (SM), endeavored to support the FCC in developing an accurate cost proxy model that is forward looking and meets the other requirements set by the FCC. U S WEST is seriously concerned whether the SM will achieve these goals, and we have doubts whether it can be corrected at all. There are numerous serious flaws in the design of the SM in the April 20, 1999 version, and it appears that the May 18, 1999 version introduces additional flaws as well. U S WEST will continue to analyze the latest version of the SM to determine whether it can be corrected to accurately estimate a forward looking cost of basic local service.

Version Control:

U S WEST and other interested parties review and test each new release of the SM. U S WEST is concerned, however, that the SM is not being marginally improved on a course for final release, instead the results of the SM vary wildly from version to version. In Nebraska, for example, the monthly expense figure in the April 20, 1999 release has dropped more than 30% since the March 2, 1999 release. In most study areas, total investment has dropped 14%. This is not indicative of model improvements, but radical shifts in the clustering process and network design philosophy.

U S WEST had hoped that, since the SM has already been adopted for federal purposes, that its basic design philosophy would be set. Instead, the current SM is really a completely new model, different from the one adopted by the FCC in October. For example, the Clustering module has a completely new divisive algorithm in the April 20, 1999 version. The new version replaces the division of a single large cluster with the creation of two zones – a center and an outlying – that are reassigned with a five step process completely different from the original. The history.doc only references the creation of a center cluster; there is no documentation or hint of the complete rewrite to the remainder of the algorithm. The new cluster process is generating spurious results, and a comprehensive analysis will take additional time to complete.

The May 18, 1999 SM version, by use of a command line argument, avoids the use of the Prim algorithm for feeder design. This is a further example of undocumented changes to the SM, in this case network design. This is further evidence that, in addition to radical changes to algorithms and inputs, the FCC has made undocumented changes to basic model philosophies.

U S WEST recommends that the FCC focus future revisions to the SM on eliminating bugs and improving the reliability and speed of the model, not on radical rewrites of network design. To do otherwise is unfair to the process of review used to adopt a model.

Documentation:

The FCC releases a new SM version approximately every two weeks. This pace of updates places a heavy burden on parties committed to reviewing the model as it develops. The FCC can ease this burden by more rigorously documenting each new version's changes. Currently the FCC provides an archive of major changes through the document "history.doc." While this is helpful, reviewers still must identify any sections of code that have been modified.

U S WEST recommends that the FCC adopts a policy of explicitly listing any sections of code that have changed since the last release. This could be in the form of a separate document, annotations to the source code itself, or through an automated system such as Visual Source Safe. The FCC should also provide a description of how each change addresses a flaw in the previous version.

Openness, Language, Slowness:

U S WEST is concerned that certain technical aspects of the SM's design will compromise interested parties' ability to review, test, and verify the model. Both the programming language and the file formats

used to transfer data from one module to another are unhelpful to end users. The very slow execution of the program is also an impediment to effective analysis.

The CLUSTINTF and FEEDDIST modules of the SM are written in Turbo Pascal, a language no longer supported by its manufacturer, Borland. Turbo Pascal is an outdated and rarely used programming language, making review difficult. Because Turbo Pascal is an outdated language, modern testing and debugging tools are not available, making step by step review of algorithms impossible. The SM code utilizes all available Turbo Pascal resources, making it impossible to insert debugging and testing code. For practical purposes, these modules are closed "black boxes." U S WEST asserts that this is a violation of the openness principle the FCC mandates for model design. To use an outdated, virtually dead, language ignores the fact that the other major cost models (BCPM, HAI, and ICM — U S WEST's UNE Model) all use Microsoft Visual Basic based programming technology. Indeed, portions of the SM are written in Visual Basic. Unlike Turbo Pascal, Visual Basic offers interactive debugging and is improved and updated regularly. The community of interested parties is familiar with Visual Basic, unlike Turbo Pascal, and is well suited to review and verify such code.

U S WEST recommends that the FCC rewrite the CLUSTINTF and FEEDDIST modules in Visual Basic, preferably version 6.0. This will go a long way toward making the SM an open, verifiable cost proxy model. U S WEST is willing to provide support for this effort, including programming expertise.

The file formats used to transfer data from module to module in the SM are also a hindrance to reviewing and verifying the model. The use of binary file formats stymies any attempt to understand the SM's logic by examination of intermediate results. If the FCC rewrites the model in Visual Basic, this problem will likely be resolved. In the unfortunate event the FCC declines to do this, it should, at a minimum, provide a utility to read the binary files and output them into a readable format, such as .dbf or .csv.

Especially in recent versions, the SM has become onerously slow and is much slower than the other cost proxy models. Because current versions cannot be validated using interactive debugging, the only way to test the model is to perform sensitivity analysis and compare the outputs. The SM is so slow, however, that the process of running scenarios must now be shared across multiple computers. The slowness of the SM is more than an inconvenience, it effectively limits the model's openness to testing. U S WEST recommends that the FCC review its code for inefficient algorithms that can be improved. Examples include: sections where calculations are needlessly repeated and logic loops which can be exited early but are run through a complete set of increments. U S WEST also recommends that the default value of "MAX SAI" be set to 1, not 2. The setting of 2 or more has a minimal impact on the SM's results, yet dramatically slows execution.

Another aspect of the slowness of the model is an anomaly of the FEEDDIST and CLUSTINTF modules that disables multitasking in Window 95. All versions released on or after April 6, 1999 have this flaw which locks the computer keyboard and mouse to user inputs during processing. Since a typical study area can take as long as ten hours to run (with larger study areas takeing substantially longer), the ability to multitask during this delay is valuable to those who do not have multiple computers. U S WEST requests that the FCC review what changes might have caused this condition and restore the model to a multitasking state.

Customer Location Data:

The selection of accurate and complete customer location data is as important as any other input to the SM. The failure to identify and model rural customers will lead to inappropriate fund sizing and unfair treatment of the very people the high cost USF most needs to serve. Based on AT&T and MCI's May 5, 1999 Ex Parte, U S WEST is concerned that the use of AT&T's flawed customer geocoding methods will lead to inaccurate and unfair treatment of rural customers.

U S WEST has shown that AT&T's geocoding method, as provided by Metro Mail, misses a large portion of rural customers, making it inappropriate for USF purposes until such time as geocoded data becomes significantly more accurate. In one of AT&T's example states from its Ex Parte, Wyoming, only 61.91%

of housing units are correctly identified by geocoding – even fewer in rural areas. In fact over 36% of the Wyoming wire centers have no customer locations geocoded at all*. Even when AT&T claims to have geocoded a customer, the data may be in error, as geocoding uses mailing addresses that can include rural letter carrier addresses and post office boxes.

AT&T's justification for using geocoding is faulty and incomplete. AT&T proposes that its geocoding method will reduce investment by at most 8% (Wyoming), while the size of the fund will decrease 20%. The shift in lines by density group will be minimal, and slightly toward rural areas. Clearly these do not go together. The most likely explanation is that AT&T's geocoding data misrepresents the highest cost customers within any density group – a problem not addressed by the Ex Parte's *Total Lines by Zone* section. U S WEST advocates de-averaging USF support because this will target economic incentives where they are most needed. AT&T's geocoding proposal works against that goal by using incomplete and inaccurate data.

The Ex Parte is also logically flawed in its comparison of ARMIS data to SM outputs. A ratio of, for instance, ARMIS poles to SM poles, is meaningless because the SM generates a theoretical network that is not the same size as the actual existing network. It is no surprise, then, that the numbers do not match in this "apples to oranges" comparison. Any direct ratio of the two sets of numbers should be disregarded as being mathematically flawed.

For the above reasons, U S WEST recommends that the FCC utilize road surrogate data based on more complete public information, such as that provided by PNR & Associates.

Untested Algorithms:

The SM includes features which, to U S WEST's knowledge, are not being reviewed nor are they being considered as candidates for use in USF proceedings. U S WEST is concerned that these untested, potentially flawed features, may unfairly bias results away from true economic costs. Because there can be no assurance that these features will yield useful results nor that their code will be updated throughout the development process, U S WEST recommends that they be removed from the program.

In the clustering module, the divisive method is the default which is being carefully scrutinized by interested parties. The FCC should remove all other clustering code and focus its efforts on the divisive method.

The hcpm.mdb option for terrain data is the default. No other input option is being considered, so it should not be an optional procedure.

The true-up line counts option is also a default. As with the others, U S WEST recommends the FCC hardcode this procedure.

Network Operations:

U S WEST questions why Network Operations expense has been reduced to zero. The April 6,1999 SM version was the last to model this expense category. Both the April 20, 1999 and May 18, 1999 SM versions ignore this expense. U S WEST recommends that the FCC review this omission and restore Network Operations expense to future SM versions.

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* Based on data provided by AT&T in a March 2, 1998 Ex Parte to the FCC.

Default Inputs:

U S WEST is disappointed and seriously concerned that the May 18,1999 default inputs represent a radical, undocumented, and unjustified departure from prior default inputs. Because the new inputs were released less than two days before the commencement of the sunshine provisions related to this proceeding, U S WEST has been unable to fully analyze the effect of the unsupported changes on the SM's results. Indeed, after subtracting the time required to download the new version, run the new SM for a small number of study areas, and deliver this document to the FCC, only four hours remained to analyze these changes. The timing and surprise nature of these changes defeats even the appearance of fairness.

U S WEST is concerned about cable inputs. While the overall change in costs averages to about $0.50 per foot, there is a dramatic rearrangement of relative costs. Considering the extensive dialog regarding cable costs and FCC presented preliminary default inputs, U S WEST can see no justification for a last minute rewrite of these inputs.

U S WEST is also concerned about plant placement. Normal placement costs have declined an average of $1.82 per foot. Additionally, the largest cuts have been made in low density areas, skewing fund sizes against rural areas. In Nebraska, for example, total plant investment declined 18% from the April 20, 1999 version, a change that appears to be largely caused by the new placement costs. Again U S WEST questions the timing of these changes. The FCC has had ample opportunities to consider placement costs, and this last minute radical cut is a disappointment and surprise.

Plant Mix:

By default, the SM dictates plant mix percentages (aerial, buried, underground) based on nation-wide defaults. U S WEST is concerned with this approach because it does not accurately model the differences in regions throughout the nation. While the SM can, in some instances, reallocate plant based on a least cost method, the default inputs lock in a mix. This is because, if the plant mix percentages add to 100%, the reallocation routine is not triggered, and the default mixes all add to 100%.

Additionally, there are other factors influencing plant mix that the SM does not consider. In portions of the US, including many served by U S WEST, severe winter weather makes the maintenance cost of aerial much higher than other plant types. Also, aerial is frequently restricted in new developments, as buried cable is perceived as enhancing property value. The scorched node scenario dictates that telephone plant does not exist when placing new plant in older neighborhoods. It is reasonable to expect that no more aerial plant would be placed in a scorched node environment than exists today.

U S WEST, especially in the states where it is price regulated, has every incentive to install the least cost plant type. U S WEST's current practices do not utilize aerial at nearly the rate of the SM defaults, either because aerial is not really as efficient as the SM suggests, or because the SM does not consider restrictions on the use of aerial. In either case, the plant mix of today's network is not that of the SM, and the SM is not, therefore, forward looking with regard to plant mix. Additionally, the SM default plant mix use of underground plant for distribution and feeder is overstated in the two lowest density groups. Current engineering practices place minimal amounts of underground plant in these lowest density groups. U S WEST recommends reassigning the plant mix in these two groups from underground to buried.

U S WEST encourages the use of more accurate and forward looking plant mix data, which is available in the SM through the use of actual plant mix data. Unfortunately, there are several conceptual and programmatic flaws in SM's implementation of the use of actual plant mix data.

When the SM user selects the option for "Plant Mix By Study Area" from the "INTRFACE" tab of the inputs worksheet, SM attempts to use ARMIS data for plant mix. What actually occurs is an averaging, of sorts, between the national defaults and the ARMIS data. The averaging is not based on sound mathematical principles and is not internally consistent; it causes invalid skewing toward aerial that is greater than either of the two separate plant mix scenarios. For example: In Nebraska, the highest density

aerial copper feeder percentage is 0% for the national defaults and 70.6% for the calculated Plant Mix By Study Area, while the ARMIS aerial percentage is 2.6%. Clearly, the model's Plant Mix By Study Area algorithm violates even a cursory reasonableness test, as 70.6% copper feeder is not even technically feasible or desirable in the highest density group.

The "Plant Mix Template.xls" worksheet generates unreasonable results due to several errors:

- Double weighting of model plant mix: To generate new plant mix percentages, the worksheet takes input from three sources: 1. The national default mix, 2. The SM model's network design from a prior run, and 3. ARMIS data. Since 2 is a direct result of 1, the national default mix is double weighted. There is no need to consider the output of the model in calculating new plant mix figures, as it is illogical and introduces endless iterative logic complications.

- Formulaic errors: The worksheet calculates weightings based on inconsistent data that multiplies inconsistent units of measure. For example: The "ARMIS Buried Ratio" is the ARMIS buried sheath distance divided by the sum of underground and aerial ($\frac{ModelBuried}{ModelUG + ModelAerial}$). The "Model Buried Ratio" is completely differernt: $\frac{ModelBuried}{ModelUG + ModelBuried + ModelAerial - ArmisUG}$. This function is not a ratio, and the inclusion of ARMIS underground is completely illogical. The resulting "Buried Ratio" is then the ARMIS ratio divided by the Model ratio, creating a mathmatically errant and arbitary number.

  The "Underground Ratio" is more simple, but no less illogical. It is the ARMIS sheath miles of underground divided by the Model sheath miles of underground. This introduces two completely incompatible figures. There is no guarantee, or even likelihood, that the overall plant sheath miles are comparable between the model and ARMIS. Comparing absolute numbers, rather than percentages is a mathmatical error.

  ARMIS ratios for underground, buried, and aerial should be percentages of total sheath miles of all plant types. They should then be averaged with mix percentages from the national default values.

- Incorrect weighting of aerial plant: The worksheet, once it calculates a new underground and buried mix, assumes that aerial is simply what is left to make the mix sum to 100% (100% minus underground minus buried). This often allows aerial to be higher than both the ARMIS and national default values. The proper solution is to apply factors to all three plant types in an intermediate table. Then create the final table by grossing each plant type up to a sum of 100%. This is done by dividing each intermediate value by the sum of all three intermediate plant type percentages. The final plant mix table will then sum to 100%, and each plant type will be treated equally.

U S WEST is providing an improved Plant Mix Template.xls file that addresses the above errors and generates more useful results. U S WEST also recommends using the Plant Mix By Study Area =1 setting for all USF purposes. These changes will prevent a bias toward too much aerial plant, which prevent the model from being forward-looking and reasonable in design.

U S WEST is concerned that the plant mix allocation is problematic in the event the plant mix inputs do not sum to 100%. The following current code allocates plant mix based on which structure type is lowest in cost:

```
if  u <=min( a, b )
       then pct_ugd := pct_ugd + free_pct
else
if  b <=min( u, a )
       then pct_bur := pct_bur + free_pct
else
if  a <=min( b, u )
       then pct_aer := pct_aer + free_pct;
```

In the event a plant type percent is set to zero, the above code may still implement its use. A plant mix input of zero usually indicates that its use is not feasible for a particular density zone. U S WEST recommends that, if a plant mix percent is set to zero, it should be a signal to not use that structure type for that particular density zone. The above code should be modified so that zero percent plant mix inputs are kept at zero after processing.

Command Line Options:

The command line option for the CLUSTINTF module has become inconsistent with changes to the CLUSTER module inputs. The new value for maximum distance limit of 17 Kft. suggests the command line option for CLUSTINTF to now be –s0.34, not –s0.36.

Specific Model Code Corrections

Drop Terminal:

The largest drop terminal supported by the SM's input workbook is 25 pairs. This is inadequate to model multi-tenant buildings, such as commercial buildings, which often exceed this limit. The SM appears to simply use the undersized drop terminal in this instance, understating costs. U S WEST recommends that the FCC create input workbook entries for larger drop terminals, or, at a minimum, provision multiple drop terminals for buildings or locations requiring more than 25 pairs.

An additional error places drop terminals that are too small. The existing code, extracted from drop_terminal_cost_fn(), is the source of this error:

```
for i := 1 to NumDropTerminalSizes do
       if lines >= DropTermCost[i]^.size then
       begin
              temp := pct_ugd*DropTermCost[i]^.CostUgd +
              pct_bur*DropTermCost[i]^.CostBur +
              pct_aer*DropTermCost[i]^.CostAer;
       end;
```

Since DropTermCost entries are in ascending order, the above code will only return the correct value when the number of lines happens to be equal to a particular terminal size. The drop terminal size should always be greater than or equal to the number of pairs entering a building. U S WEST recommends the FCC replace the above code with the following corrected code:

```
for i := NumDropTerminalSizes downto 1 do
       if DropTermCost[i]^.size >= lines then
       begin
              temp := ....
       end;
       else
              break;
```

SAI Logic:

The code that places SAI plant selects SAIs that are too small. The routine below, copied from calculate_feeder_technology(), selects the costs of the SAI that has a line size less than the number of lines served.

```
for n := 1 to NumXCBoxSizes do
       if 126  >= IntfcCost[n]^.NumLines
              then tmp3 := IntfcCost[n]^.cost;
```

The correct method would be to select the SAI that would be the next size larger than the number of required lines. U S WEST recommends that the FCC replace the above code with the following correction:

```
For n := NumXCBoxSizes downto 1 do
If IntfcCost[n]^.NumLines >= 126 then
       tmp3 := IntfcCost[n]^.cost
else
       break;
```

Plant Structure:

The cable cost lookups that are part of structure_cost_fn() can be simplified. Instead of calling feed_cable_cost() and dist_cable_cost() multiple times, U S WEST recommends calling each function once with all the plant percentages set to 1.0. The resultant cable costs that are returned would represent the cable costs from the tables with no impact due to plant distribution. The revised code follows:

```
if feeder_indicator = 1 then
begin
       cc := feed_cable_cost( fiber_lines, density, fiber, uc, bc, ac, uf1, bf1,
af1, one, one, one);
       cc := feed_cable_cost( copper_lines, density, copper24, uc1, bc1, ac1,
uf, bf, af, one, one, one);
end;
else
begin
       uf1 := zero;
       bf1 := zero;
       af1 := zero;
       cc := dist_cable_cost( copper_lines, density, g24, uc1, bc1, ac1, one,
one, one);
end;
```

Since this code is used for each microgrid, there should be a reduction in processing time.

In calculating structure costs, Softrock and Normal costs are incorrectly applied. The code below was copied from structure_cost_fn(). The costs that are reversed are underlined.

```
if ( (depth_to_bedrock > critical_depth) and (soil_texture_indicator=0) ) then
{ use normal values }
begin
       if feeder_indicator=1 then
       begin
              ugd_structure := ugd_share*NormalStruc[zone]^.FeedUgd;
              bur_structure := bur_share*NormalStruc[zone]^.FeedBur;
              aer_structure := aer_share*NormalStruc[zone]^.FeedAer;
       end
       else
       begin
              ugd_structure := ugd_share*NormalStruc[zone]^.DistUgd;
              bur_structure := bur_share*NormalStruc[zone]^.DistBur;
              aer_structure := aer_share*NormalStruc[zone]^.DistAer;
       end;
       if feeder_indicator=1 then
              NumberOfDucts := round( copper_lines/feed_copper_cable_capacity +
half ) + round( fiber_lines/fiber_cable_capacity + half ) + 1
       else
              NumberOfDucts := round( copper_lines/dist_copper_cable_capacity +
half ) + 1;
       if NumberOfDucts < 2 then NumberOfDucts := 2;
       ManholeSpacing := ManholeSpac[zone]^.ManholeSpacing;
       i := NumManholeSizes;
       repeat
              i := i-1;
              if NumberOfDucts >= ManholeCost[i]^.DuctCap
                     then manhole_cost :=
ManholeCost[i]^.NormalCost/ManholeSpacing; { manhole cost per foot for
underground}
       until NumberOfDucts >= ManholeCost[i]^.DuctCap;
       if NumberOfDucts > ManholeCost[NumManholeSizes-1]^.DuctCap
              then manhole_cost := manhole_cost +
ManholeCost[NumManholeSizes]^.SoftCost*(NumberOfDucts -
ManholeCost[NumManholeSizes-1]^.DuctCap);
end
else  { use softrock values }
begin
       if feeder_indicator=1 then
       begin
              ugd_structure := ugd_share*SoftRockStruc[zone]^.FeedUgd;
              bur_structure := bur_share*SoftRockStruc[zone]^.FeedBur;
              aer_structure := aer_share*SoftRockStruc[zone]^.FeedAer;
       end
       else
       begin
              ugd_structure := ugd_share*SoftRockStruc[zone]^.DistUgd;
              bur_structure := bur_share*SoftRockStruc[zone]^.DistBur;
              aer_structure := aer_share*SoftRockStruc[zone]^.DistAer;
       end;
       if feeder_indicator=1 then
              NumberOfDucts := round( copper_lines/feed_copper_cable_capacity +
half ) + round( fiber_lines/fiber_cable_capacity + half) + 1
       else
              NumberOfDucts := round( copper_lines/dist_copper_cable_capacity +
half ) + 1;
       if NumberOfDucts < 2 then NumberOfDucts := 2;
       ManholeSpacing := ManholeSpac[zone]^.ManholeSpacing;
       i := NumManholeSizes;
       repeat
              i := i-1;
              if NumberOfDucts >= ManholeCost[i]^.DuctCap
                     then manhole_cost :=
```

```
ManholeCost[i]^.SoftCost/ManholeSpacing; { manhole cost per foot for
underground}
       until NumberOfDucts >= ManholeCost[i]^.DuctCap;
       if NumberOfDucts > ManholeCost[NumManholeSizes-1]^.DuctCap
              then manhole_cost := manhole_cost +
ManholeCost[NumManholeSizes]^.NormalCost*(NumberOfDucts -
ManholeCost[NumManholeSizes-1]^.DuctCap);
end;
```

U S WEST recommends that the FCC change the underlined code listed above. The correct code should reverse the underlined entries so that normal terrain uses normal costs and soft rock terrain uses soft rock costs.

Attachment A

DOCUMENT OFF-LINE

This page has been substituted for one of the following:

o An oversize page or document (such as a map) which was too large to be scanned into the ECFS system.

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